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Proposed VR simulator with ability to discriminate velocity of approaching car

S. Aoyama[†1] , Y. Terata[2] , K. Saruta[2] and G. Chen[2]

[1]Graduate School of Systems Science and Technology, Akita Prefectural University, Japan
[2]Faculty of Systems Science and Technology, Akita Prefectural University, Japan

Abstract

In Japan, fatal traffic accidents have accounted for the majority of overall traffic fatalities by the elderly pedestrian. One of the major reasons why elderly pedestrians are involved in traffic accidents is that they misread the velocity of the approaching car because aging leads to decline in sensory function. We developed an inspection system that can quantify the ability of persons to discriminate the velocity of an approaching car using virtual reality(VR) for the purpose of educating the traffic system. In this Simulator, it presents a video in which two types velocity of car moves toward the subject. The subjects answer a faster car in the two types velocity car. In this inspection, this simulator get again recognize the decline of their own sensory function.

Categories and Subject Descriptors (according to ACM CCS): K.3.1 [Computer Graphics]: Computer Uses in Education—Collaborative learning

1. Introduction

According to Japan ' s traffic accident mortality rate data, people over 65 years old account for 55 percent of traffic fatalities. Furthermore, pedestrians account for 46.7 percent [AUT15].

One of the major reasons why elderly pedestrians are involved in traffic accidents is that they often misread the velocity of the approaching car because aging leads to decline in sensory function [TMS*08].

We developed an inspection system that can quantify the ability to discriminate the difference in the velocity of an approaching car using VR technology for the purpose of educating the traffic safety. In this simulator, you are presented the two cars with different velocity using VR technology. And answering the question of which is faster one. The simulator inspects that can quantify the ability to discriminate the difference in the velocity of an approaching car. By using this simulator, it is possible that the elderly themselves become aware decline in sensory function. And this simulator can provide opportunity for themselves that prompt the affording behavior than before.

2. Proposed VR simulator with ability to discriminate velocity of approaching car

You can experience this simulator in state of sitting. You mounted the head mounted display (HMD) equipped with " LeapMotion " on their head during the experiment. The " LeapMotion " is used when you answer the faster one of the two cars. The whole process is spent approximately 5 minutes. Inspection video are three types situation of daylight, evening and night. The car approaches a straight paved road at a constant velocity is towards the subjects in all situations (The car only turned on its headlights at night). Position of experience person's point of view is the location of 1.5 meters on the ground. In addition it will also be reflected in the video by motion of the head. the velocity of the approaching car varied over the values 45 km/h, 60 km/h, and 75 km/h. Figure 1 shows compares images in daylight, evening, and night. Figure 1 (a) shows day images, Figure 1 (b) shows evening images, and Figure 1 (c) shows night images.

(a) Daylight (b)Evening (c)Night

Figure 1: *Compare images in daylight, evening and night*

† Chairman Eurographics Publications Board

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2.1. Conditions of approaching car velocity used in the simulator

Table 1 shows the Conditions of approaching car velocities used in this simulator, which ranged over 45 km/h, 60 km/h, and 75 km/h. The appearance distance between the subject and car was varied with each velocity. Further, the disappearance distance between the subject and the car was 47 meters in front of the subject. The presentation time of the car was 2 seconds in all conditions.

Table 1: *Conditions of approaching car velocity used in the simulator*

Car Velocity[km/h]	45	60	75
Appearance Position[m]	72.0	80.3	88.6
Disappearance Position[m]	47.0		
Disappearance Position[m]	47.0		

2.2. Flow of one operation in this simulation

Figure 2 shows a look of the during simulation. Table 2 shows the flow of one operation in this simulator, which was as follows: The system selected velocities at random from the three possible approaching car velocities in one operation. First, one of the movie selected by the system was displayed for 2 seconds at the appearance point of the car in a static state (1st Trial: STOP). Next, a movie of the car approaching the subject was displayed for 2 seconds from the state in which the car was stationary (1st Trial: MOVE). The entire screen of the HMD then went dark for 2 seconds (Black Screen). Subsequently, another movie was similarly displayed (2nd Trial). The subject observed and compared the approach velocity of both cars in virtual reality, then selected the fastest car via a virtual button switch (1 or 2) within 5 seconds (Evaluation). The flow of one section in this simulator was given as follows: All the combinations of each time zone (day, evening, and night) and two car velocities (45-60 km/h, 45-75 km/h, and 60-75 km/h, moreover reversed back and forth), a total of 18 operations were displayed at random.

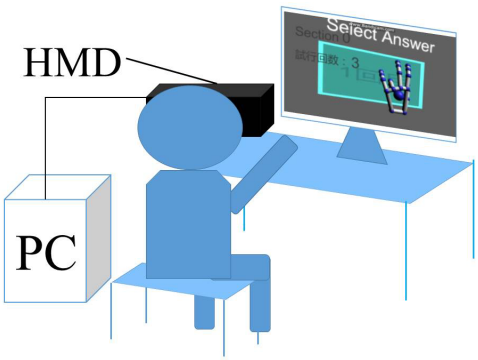

Figure 2: *A look of the during simulation*

Table 2: *Flow of one operation in this simulator*

1st Trial		Interval	2nd Trial		Evaluation
4s		2s	4s		5s
2s	2s		2s	2s	
STOP	MOVE	Black Screen	STOP	MOVE	

3. Experience Results

It displays the percentage of correct answers to the HMD after simulator experience. Also as a CSV file the detailed results are stored in a local directory (Table 2). Therefore, it is possible to check the situation that you had misjudged the determination of the velocity.

Table 3: *Result table*

1st	Day
Combination: 45km/h-75km/h	Answer: True
2nd	Night
Combination: 45km/h-75km/h	Answer: True
3rd	Evening
Combination: 75km/h-60km/h	Answer: False
«omission»	
17th	Evening
Combination: 45km/h-60km/h	Answer: False
18th	Day
Combination: 45km/h-75km/h	Answer: True
Percentage of Collect Answers :83 %	

References

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